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Testing Equipment for Construction Materials

HUMBOLDT

www.humboldtmfg.com
1.800.544.7220 • 708.468.6300

ASTM D7698

EDG

DENSITY MOISTURE NUCLEAR FREE

Touch-Screen or Touch Pad—
You have your choice with the new Humboldt H-4114SD EDG. The gauge features a 4.3" touch-screen, which provides complete control or you can also use the menu-driven touch pad.

Li-ION

Easy to Power—
The EDG is powered by a rechargeable Li-ION battery, which provides up to 60 hrs. of runtime. A car charger is available, order H-4114SD.100

GPS

GPS—
The EDG is equipped with GPS, which keeps track of the actual location of your readings to ensure locations and validity of tests.

Find my Gauge

Find my Gauge (optional)—
You can now track the location of your gauge with the Find My Gauge service. If it's lost or stolen, you will get text messages pinpointing its location.

Bluetooth Enabled—
The new EDG gauge can connect to your PC for downloading test results via its Bluetooth wireless technology. No more cables and gauges on your desk. Bluetooth provides a reliable and secure connection up to 30 feet.

USB Port—
The EDG also has a USB slot, which provides a convenient way to capture test data and take it with you, as well as provide an easy way to upgrade the gauge's firmware. Firmware upgrades will be available via the internet from our website.

Electrical Density Gauge— H-4114SD.3F
The Electrical Density Gauge (EDG) is a nuclear-free alternative for determining the moisture and density of compacted soils used in road beds and foundations. The EDG is a portable, battery-powered instrument capable of being used anywhere without the concerns and regulations associated with nuclear safety. Its user-friendly, step-by-step menu guides the user through each step of the testing procedure and cautions the user when values do not correspond to established curves for the material being tested.

Easy-to-use, the EDG can be used as a construction aid to monitor day-to-day compaction operations by providing performance and measurement results highly comparable to those achieved with traditional methods, including the nuclear gauge and/or a sand-cone and oven moisture test combination. When conducting a test, the EDG measures and displays the results for wet and dry density, gravimetric moisture content and percent compaction.

For contractors the advantages of using the EDG are:

- it does not require a highly-trained or licensed technician,
- it does not require special handling for shipping or regulatory compliance for hazardous materials
- it is easy to learn and easy to use with its step-by-step menu
- lightweight and easily transportable
- it is accurate and repeatable with results that mirror known testing methods

The EDG measures the electrical dielectric properties and moisture levels of compacted soil using high, radio frequency traveling between darts driven into the soil being tested. The dart's depth of penetration positively determines the depth of measurement. Darts are available in 4", 6", 8", 10" and 12" lengths. In addition, the darts have been designed with a taper, which ensures a continual positive contact with the soil for accurate measurements.

During the testing procedure, four tapered electrodes (darts) are driven into the ground in a cross pattern using the supplied template. Between the two sets of two tapered darts, four point-to-point electrical measurements are made and the electrical characteristics averaged. The dielectric properties that are measured by the unit are compared to a "soil model", which has been developed and programed into the unit prior to testing. These soil models are required only once for each soil type. The soil model is used as a calibration reference during the testing procedure. It is developed by establishing a curve of measured dielectric properties for different densities and moisture combinations of the actual soil to be tested or a similar material. This soil model is used by the unit through a proprietary correction algorithm to automatically determine the wet and dry density, gravimetric moisture content and percent compaction values for the material being tested. Soil models can be named using the unified soil classifications listed in the drop-down menu or unique names can be entered using the alpha-numeric keypad. In addition, the temperature probe, which is inserted into the material being tested ensures accurate results by compensating for changes in recorded temperatures. Similar to nuclear gauges, proctor numbers for optimum compaction may be input into the gauge, which would allow for percent compaction to be automatically calculated and displayed at the end of each test. The Proctor numbers would be input into the gauge during the development of the soil model. When determined, this value is entered into the EDG to enable the computation of percent compaction.

EDG Software

EDG Software will allow you to communicate effortlessly with your EDG gauges and only requires minimal setup by the user. EDG Software provides a complete solution for the acquisition, storing, and presentation of Job and Soil Model data. EDG Software works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel. Jobs can be grouped together within projects for organization and reporting.

EDG Software Features

- Communicate with all your EDG gauges.
- Download Job Data.
- Create customized reports from downloaded job data.
- Download Soil Model Data.
- Create reports from downloaded soil model data.
- Upload soil models to any EDG.
- Input proctor data for use in job data or soil model data.
- View maps of test locations, using Google Earth.
- Time/Date, GPS stamps for each test

Specifications	
Wet Density Range	typical compacted earth sites range
Dry Density Accuracy	within 3% of standard tests
Moisture Content Range	typical compacted earth sites range
Moisture Content Accuracy	within 2% of standard tests
Operating Temperature	0-50°C
Ambient Operating Humidity	5-90%, non-condensing
Power	Li Ion battery (AA battery optional)
Battery Life	approx. 60 hrs. of runtime
Battery Charger	110-240 V 50/60Hz
Dimensions	21" x 17" x 8" (533 mm x 432 mm x 203mm)
GPS	± 3m
Net Weight	15 lbs. (6.8kg)

4" Dart— H-4114.4
6" Dart— H-4114.6
8" Dart— H-4114.8
10" Dart— H-4114.10
12" Dart— H-4114.12

Darts are designed in various lengths to correspond to different lift heights. They can be sold individually, and (4) are required.

EDG Calibration Verifier— H-4114.CAL

EDG Gauge includes: Console/Case; 4-tapered 6" darts; hammer; soil sensor and cables; dart template, temperature probe, battery charger, field verifier, safety glasses.

The Humboldt HS-5001SD
Nuclear Density Gauge— state-of-the-art

Humboldt's NEW HS-5001SD Moisture/Density Gauge provides easier and more efficient operation, data collection and processing, safety and repair than any other gauge in its class. This new Gauge uses state-of-the-art technology to bring you a host of new features to make your job easier. Featuring a 4.3" touch-screen, the SD Gauge provides intuitive operation of all gauge operations. You also have the option to use the gauge's touch pad instead of the touch-screen, if desired.

The SD's versatility allows it to measure density through direct transmission and backscatter modes, as well as including thin lift and trench modes, as well as moisture determinations. The gauge uses an advanced micro-processor-based technology to provide highly-accurate measurements of density and moisture that are automatically computed for direct readouts of wet density, dry density, moisture content, percent of moisture, percent of compaction (Proctor or Marshall), void ratio and air voids. The SD Gauge complies with all pertinent standards: ASTM D6938, D2950, C1040 and AASHTO T310.

The gauge is calibrated by the Five-block calibration method.

Touch-Screen or Touch Pad—
You have your choice with the new Humboldt HS-5001SD Moisture/Density Gauge. The gauge features a 4.3" touch-screen, which provides complete control or you can also use the menu-driven touch pad.

Easy to Power—
The SD Touchscreen Gauge is powered by a rechargeable Li-ION battery, which provides up to 60 hrs. of runtime. In addition, the gauge can also be powered by six standard AA alkaline batteries, which provide up to 1 month of service. Car charger available.

Li-ION

GPS—
The SD Gauge is equipped with GPS, which keeps track of the actual location of your readings to ensure locations and validity of tests.

GPS

Find my Gauge—
You can now track the location of your gauge with the Find My Gauge service. If it's lost or stolen, you will get text messages pinpointing its location.

Find my Gauge

Bluetooth Enabled—
The new SD gauge can connect to your PC for downloading test results via its Bluetooth wireless technology. No more cables and gauges on your desk. Bluetooth provides a reliable and secure connection up to 30 feet.

USB Port—
The SD gauge also has a USB slot, which provides a convenient way to capture test data and take it with you, as well as provide an easy way to upgrade the gauge's firmware. Firmware upgrades will be available via the internet from our website.

Easy Self Repairs—
The SD Gauge's modular design enables it to be serviced in the field by you, if necessary. No need to send the gauge in for repair, we'll send you the necessary components and walk you through any repair procedure.

Moisture/Density Gauge— HS-5001SD121
Measures to 12" (300mm) depth in 1" (25mm) increments.

Moisture/Density Gauge— HS-5001SD122
Measures to 12" (300mm) depth in 2" (50mm) increments.

Moisture/Density Gauge— HS-5001SD081
Measures to 8" (200mm) depth in 1" (25mm) increments.

Moisture/Density Gauge— HS-5001SD082
Measures to 8" (200mm) depth in 2" (50mm) increments.

Nuclear Density Gauge Sales: 1.800.537.4183

The Humboldt HS-5001EZ
Nuclear Density Gauge— easy is just the beginning

Easy to Operate—
Humboldt's HS-5001EZ Moisture/Density Gauge is just that— easy to operate. The EZ gauge features a menu-driven control panel with easy-to-use, built-in test routines and auto features, making testing a quick and accurate operation.

Easy to Power—
The EZ is powered by six standard AA alkaline batteries, which provide up to 2000 hrs of service. No chargers are needed and you can buy batteries almost anywhere, including the corner convenience store.

Easy Self Repairs—
The EZ gauge also uses a modular design, which allows it to be serviced in the field, if ever necessary. With this gauge, you don't have to send it back to the factory for repairs, we'll send you the necessary components and walk you through any repair procedure.

Plus, the Humboldt 5001EZ Gauge now only requires leak tests every 12 months.

Humboldt's HS-5001EZ Moisture/Density Gauge is just that—easy. Easy to operate, easy to power and easy to service. The EZ gauge features a menu-driven control panel with easy-to-use, built-in test routines and auto features, making testing a quick and accurate operation. It also features our innovative trigger release handle that eliminates pinched fingers while providing smooth operation.

Available in 8" (200mm) and 12" (300mm) lengths with either 1" (25mm) or 2" (50mm) increments, the EZ gauge provides a single gauge solution to density and moisture measurements.

The EZ's versatility allows it to measure density through direct transmission and backscatter modes, as well as including thin lift and trench modes, as well as moisture determinations. The gauge uses an advanced microprocessor-based technology to provide highly-accurate measurements of density and moisture that are automatically computed for direct readouts of wet density, dry density, moisture content, percent of moisture, percent of compaction (Proctor or Marshall), void ratio and air voids.

The EZ Gauge complies with all pertinent standards: ASTM D6938, D2950, C1040 and AASHTO T310.

The gauge is calibrated by the Five-block calibration method.

Moisture/Density Gauge— HS-5001EZ081
Measures to 8" (200mm) depth in 1" (25mm) increments.

Moisture/Density Gauge— HS-5001EZ082
Measures to 8" (200mm) depth in 2" (50mm) increments.

Moisture/Density Gauge— HS-5001EZ121
Measures to 12" (300mm) depth in 1" (25mm) increments.

Moisture/Density Gauge— HS-5001EZ122
Measures to 12" (300mm) depth in 2" (50mm) increments.

Nuclear Density Gauge Sales: 1.800.537.4183

Nuclear Density Gauge Sales: 1.800.537.4183

Radioactive Materials Data Needed for License Application

Radioactive Material	Chemical/Physical Form	Maximum Amount
Cesium-137	Sealed Source Humboldt 2200064	Not to exceed 11 millicuries per source
Americium-241:Be	Sealed Source Humboldt 2200067	Not to exceed 44 millicuries per source

Radiological

Gamma Source	
Material, Type and Amount:	Cs-137, 370MBq (10mCi)
Special Form Registration:	USA/0356/S-96 Rev 12
ANSI and ISO Class:	ANSI 77C66535
Neutron Source	
Material, Type and Amount:	Am-241: Be, 1.48GBq (40mCi)
Neutron Yield:	70 Knps ±10%
Special Form Registration:	CZ/1009/S-96 Rev 1
ANSI and ISO Class:	ISO/99/C66545
Source	
Type:	Sealed Source, Special Form
Housing:	Stainless Steel, Double Encapsulated
Surface Dose Rates	18.7 mrem/hr Maximum (Neutron and Gamma)
Transit (shipping) Case	DOT 7A, Type A, Yellow II Label, O.2 TI

Measurement: Density at 125 pcf (2000 kg/m3)

Direct Transmission, 6" (150mm)	15 seconds (Fast)	1 minute (Std.)	4 minutes (Slow)
Precision, pcf (kg/m3)	±0.5 (8)	±0.25 (4)	±0.13 (2)
Chemical Error, pcf (kg/m3)	±1.0 (16)	±1.0 (16)	±1.0 (16)
Surface Error, pcf (kg/m3)	-0.5 (8)	-0.5 (8)	-0.5 (8)
Measurement Depth: 2 to 12" (50 to 300mm)			
Backscatter, 3.5" (88mm)	15 seconds (Fast)	1 minute (Std.)	4 minutes (Slow)
Precision, pcf (kg/m3)	±1.0 (16)	±0.5 (8)	±0.25 (4)
Chemical Error, pcf (kg/m3)	±2.5 (40)	±2.5 (40)	±2.5 (40)
Surface Error, pcf (kg/m3)	-3.0 (48)	-3.0 (48)	-3.0 (48)
Measurement Depth: 3.5" (88mm)			
Moisture at 10pcf (160kg/m3)	15 seconds (Fast)	1 minute (Std.)	4 minutes (Slow)
Precision, pcf (kg/m3)	±0.5 (8)	±0.25 (4)	±0.13 (2)
Surface Error, pcf (kg/m3)	-0.25 (4)	-0.25 (4)	-0.25 (4)
Measurement Depth: 4-8" (100 to 200mm)			

Electrical

Displays— HS-5001SD: HS-5001EZ:	 TFT, color LCD with back-light, 16:9, 480 x 272 pixel 4 lines x 20 alphanumeric w/ backlit liquid crystal display
Timer Stability:	0.01%
Power Supply Stability:	0.10%
Power Source— HS-5001SD: HS-5001EZ:	 Li Ion battery (AA battery optional) Six alkaline AA-size batteries
Power Consumption— HS-5001SD: HS-5001EZ:	 Active—110mA — Battery Life—60 hours runtime Active—6.5mA — Battery Life—1400 hours
Power Protection:	Main Batteries—Circuit Breaker Regulated Supplies—Short Circuit Proof
Low Battery Condition:	LOBAT Alarm and Auto Shutoff for low and dead battery conditions
Battery Life	Remaining Battery Life Automatically Estimated at Power-up by activating TEST routine

All models Include:
Gauge, Reference Standard, Source and Case Certification, Wipe Test Kit, Rod Guide/Scraper Plate, Drill Pin, Four Pound Hammer, Drill Pin Extraction Tool, Zippered Accessory Case, Transit Case, Radiation Safety Manual and Operator's Manual.

Mechanical

Operating Temperature:	14 to 158°F (-10 to 70°C) ambient, 347°F (175°C) Material Surface
Storage Temperature:	-70 to 185°F (-55 to 85°C)
Humidity:	98% without condensation, Rain-Resistant Construction
Vibration:	0.1" (2.5mm) at 12.5 Hz
Materials:	
Shielding:	Tungsten Powder Alloy
Source Rod:	440C Stainless steel, Induction, heat treated to 55 Rockwell C
Gauge Base:	Computer-Machined 6061-T6 Aluminum, Hard-Coated and Teflon Impregnated
Post and Frame:	Computer-Machined 6061-T6 Aluminum, Anodized for Anticorrosion
Index Rod:	7075 aluminum, Hard Coated and Teflon Impregnated
Top Shell:	Injection-Molded Noryl with Integral Color
Bearing:	Relieved Bronze with Neoprene Seals
Screws/Fittings:	Stainless Steel and Brass

Dimensions/Weight

Gauge:	
Dimensions (base):	15.75" x 8.66" x 5.5" (400 x 220 x 140mm)
Handle Height:	18" or 21.5" (450 or 550mm)
Weight:	30 lbs (13.6kg)
Reference Standard:	
Dimensions:	25" x 7.8" x 3" (350 x 200 x 75mm)
Weight:	10 lbs (4.5kg)
Transit Case:	
Dimensions:	31" x 14" x 19.5" (787 x 356 x 495mm)
Weight:	31 lbs (11.8kg)
Accessory Case (loaded):	
Dimensions:	19.7" x 9.8" x 5" (500 x 250 x 125mm)
Weight:	16 lbs (7.3kg)
Total Shipping Weight:	90 lbs (41kg)

Tool Set
HS-200112

HS-000176

HS-200127

HS-200145

HS-200130

HS-200177

HS-001057

HS-200313

HS-200820

EZ Gauge Tool Set, Complete with Case— HS-200112
Tool kit includes: rod guide/scraper plate, drill pin, four-pound hammer, pin extraction tool and zippered accessory case.

Drill Rod— HS-200130

Rod Extraction Tool— HS-200145

Scraper Plate/Rod Guide— HS-200127

4 lb Double-Faced Hammer— HS-000176

Leak Test Kit, 10-pack— HS-200177
Leak Test Kit, 2-pack— HS-200185
Each leak test kit contains all of the materials necessary for users to perform a leak test on sealed source devices. These test kits include analysis service from Humboldt. Humboldt Scientific, Inc. provides leak test kits and analysis services for both portable and fixed nuclear gauges in accordance with Wipe Test Procedures. Humboldt is licensed by the North Carolina Division of Radiation Protection license # 092-0750-1 to provide sealed-source leak testing on any radioactive material with atomic number 3-105 inclusive; and, has National reciprocity recognition. State-of-the-art leak testing equipment, low cost, and prompt turn-around service ensure accurate and convenient measurement of your samples.

Infrared RS232 Data Cable and Software— HS-200313
Cable and software for connecting EZ Gauge to a computer or printer via RS232 port.

Caution Radioactive Material Sign— HS-001057
8" x 10" metal sign.

Nuclear Gauge Security Restraint— HS-200820
Cable security restraint effectively locks containment box to vehicle or other structure. One-piece cable web drops easily over box and allows user to lock cables directly to containment box closures to prevent opening, as well as securing the complete box to prevent removal. Web is easily moved from vehicle to vehicle and collapses for easy storage when not in use. Allows for visibility of security labels on case when in use. A minimum of three padlocks are required, but not included.

Padlock— HS-000177
Padlock, which can be keyed so a set uses the same key.

For information and class schedules for Radiation Safety Classes and Radiation Safety Officer Courses, click the training classes link on our website:
www.humboldtscientific.com
or call: **1.800.537.4183**

Radiation Safety and Certification Classes

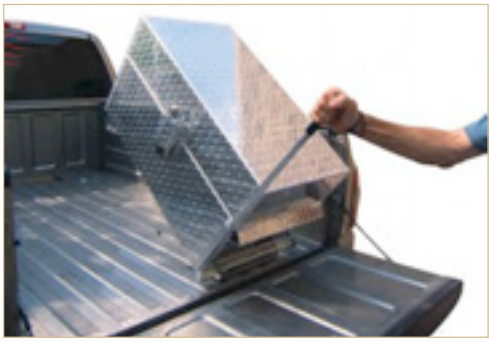
Radiation Safety Course
A one-day course in radiation safety and operation for users of nuclear portable Moisture Density Gauges. The class satisfies the USNRC and Agreement States' requirements for gauges manufactured by Humboldt and other manufacturers of portable, nuclear Moisture Density Gauges. A certificate of training will be issued to those who successfully complete the class.

Hazmat Refresher Course also available

Radiation Safety Officer's Course
A one-day training class to qualify participants to serve as facility Radiation Safety Officers. This course satisfies USNRC and US Dept. of Transportation Regulations, and is directed toward the individual responsible for the organization's radiation safety program. Course participants will receive a comprehensive training manual, as well as the recent NRC Guidance Document: Program-Specific Guidance About Portable Gauge Licenses (NUREG-1556, Vol. 1).

HS-130508

HS-130512



HS-200800— Boxes include mounting bracket

Digital Radiation Survey Meter— HS-130508
Digital Radiation Survey Meter, NIST Traceable— HS-130508C
The HS-130512C survey meter provides an easy-to-use tool for surveying worksites, storage areas and transportation vehicles and is an inexpensive way to adhere to the survey requirements of an ALARA (As Low As Reasonably Achievable) Program. The HS-130512C measures alpha, beta, gamma, and x-rays. Its digital display shows readings in your choice of counts per minute (CPM) or mR/hr, or in accumulated counts. A red LED flashes and beeper sounds with each count detected and when the radiation reaches a user set alert level. Uses one 9-volt alkaline battery. Battery life is up to 2,000 hours at normal background radiation levels.

Operating Range	mR/hr - .001 (1µR) to 100 mR/hr; µSv/hr - .01 to 1000; CPM - 0 to 350,000; CPS - 0 to 5000; Total/Timer - 1 to 9,999,000 cts.
Gamma Sensitivity	1000 CPM/mR/hr referenced to Cs-1 37
Accuracy	±10% typical (NIST), ±15% maximum
Energy Sensitivity	Detects alpha down to 2.5 MeV; typical detection efficiency at 3.6 MeV is greater than 80%. Detects beta at 50 keV with typical 35% detection efficiency. Detects beta at 150 keV with typical 75% detection efficiency. Detects gamma and x-rays down to 10 keV typical through the window, 40 keV minimum through the case. Normal background is 5-20 CPM.

For Recalibration and NIST traceable calibration of meters, contact Humboldt Scientific at: 1.800.537.4183

Analog Radiation Survey Meter— HS-130512
Analog Radiation Survey Meter, NIST Traceable— HS-130512C
The HS-130512C survey meter is a compact, general purpose meter capable of detecting alpha, beta, gamma, and x-rays over 3 selectable ranges. A red count light flashes and a beep sounds with each event detected. Uses one 9-volt alkaline battery. Battery life is up to 2,000 hours at normal background radiation levels.

Operating Range	0-.5, 0-5, 0-50 mR/hr; 0-500, 0-5,000, 0-50,000 CPM or 0-500 µSv/hr 0-50 mR/hr.
Gamma Sensitivity	1000 CPM/mR/hr referenced to Cs-1 37
Accuracy	±15% of reading (referenced to Cs-137)
Energy Sensitivity	Detects alpha down to 2.5 MeV; typical detection efficiency at 3.6 MeV is greater than 80%. Detects beta at 50 keV with typical 35% detection efficiency. Detects beta at 150 keV with 75% typical detection efficiency. Detects gamma and x-rays down to 10 keV typical through the window, 40 keV minimum through the sidewall of the detector. Normal background is approximately 10-20 CPM.

Nuclear Gauge Containment System for Nuclear Gauges
The NUX safety containment box is an enhanced field security system for nuclear gauges. Constructed of heavy-duty aluminum diamond plate, the NUX can be securely mounted to a host vehicle using the locking hinge pin. The box features a titanium series, high-strength lock assembly, which provides a secure storage enclosure for your gauge in its factory protective container. In addition, the NUX tilting feature makes accessing your gauge an easy operation. Help prevent theft, damage, back injuries, misuse of equipment, improper or unauthorized access to equipment or other misguided actions, which may result in unforeseen costs to your company.

NUX Safety Containment Cases

Mounting Bracket for all style cases	HS-200801
Nux Case for Humboldt Gauge	HS-200800
Nux Case for Troxler 3400 Series Gauges	HS-200802
Nux Case for CPN Gauges	HS-200803

NOTE: When the metal transportation box is mounted in a vehicle it effectively becomes part of the vehicle. It is not part of the TYPE A package nor is it an overpack as defined by U.S. DOT. Therefore, the mounted transportation box is not subject to HAZMAT labeling requirements and no radiation warning markings are required on it.

Percometer— H-4112.3F

The Percometer is a reliable, accurate, lightweight and easy-to-use instrument for measuring the dielectric value (εr), electrical conductivity (J) and temperature of materials indoors and outdoors. Dielectric value is an indication of the volumetric moisture content and the state of molecular bonding in a material. Electrical conductivity is a reflection of ionic concentration, water content and temperature. The ability of the Percometer to measure these values has made it an extremely versatile tool in a multitude of tasks.

The Pecometer has been very successful in providing data for The Tube Suction Test (TST) which was developed by the Finnish National Road Administration and the Texas Transportation Institute (TTI) for assessing the moisture susceptibility of granular base materials. Moisture susceptibility represents the potential of a soil to develop or retain water through capillary action, which can produce a detrimental or unstable condition under road surfaces and related structures, such as bridges. In this type of study the Percometer is capable of reading differences in the soil's relative dialectric value, which is impacted by the capillarity of rising water in the soil. The water rising due to capillarity transforms the soil's relative dielectric value. The dielectric value (DV) is a measure of the unbound water within a soil sample. Unbound water directly influences material strength and the ability of a soil to resist the effects of repeated freeze-thaw cycling.
The Tube Suction Test reveals the state of water bonding within the soil particles and should not be considered as a simple measure of moisture content. The Percometer is used today by the laboratories, geoservice and road data service units of the Finnish Road Enterprise, and in the Geotechnical Laboratory of the Tampere University of Technology. In the United States and Canada, Percometers are used by, among others, the Texas Transportation Institute, the Texas Department of Transportation, the Office of Minnesota Road Research and the University of Saskatchewan. Other uses of the Percometer include:

Moisture Damage (Structural damage)
When moisture infiltrates a wall, causing damage, εr values will be significantly higher than those from undamaged areas of the wall.

Asphalt Air Voids (Pavement quality control)
Air is also one of the volumetric components that influences εr. Measuring εr can provide an indication if a pavement has been sufficiently compacted.

PROBES

H-4112.SF— Surface Probe (60mm dia.)
εr (1 to 40) with an accuracy of +/- (0.1 + 1%) Electrical conductivity (0 to 9999mS/cm) Temperature (-40 to +80C) Recommended applications: Laboratory use, Tube Suction Test, detection of moisture in structures with even surfaces (e.g. behind shower room tiling)

H-4112.SV— Surface Probe (60mm dia.)
εr (1 to 200) with an accuracy of +/- (0.25 + 2%) Electrical conductivity (0 to 9999mS/cm) Temperature (-40 to +80C) Recommended applications: Laboratory use (high Er)

H-4112.TFS— Short Tube Probe TFS (L = 18 cm)
εr (range: 1 to 15) with an accuracy of +/- (0.05 + 1%) Electrical conductivity (0 to 9999mS/cm) Temperature (-40 to +80C) Recommended applications: Laboratory tests, e.g. triaxal testing of aggregates

H-4112.TFL— Long Tube Probe TFL (L = 100 cm)
εr (range: 1 to 15) with an accuracy of +/- (0.05 + 1%) Electrical conductivity (range: 0 to 9999mS/cm) Temperature (range: -40 to +80C) Recommended applications: Field measurements.

Other Probes available, please enquire.

H-4112.3F includes H-4112.SF surface probe. Other probes available.

Soil Moisture
Since εr is a function of the amount of free water in a material, Percometer can be an effective tool for determining soil moisture.

Frozen/Unfrozen (Soils and Road Structures)
When the free water in a material freezes the conductivity drops to around zero and εr values decrease to values ranging from 4 to 12.

Frost Susceptibility (Soils and subgrade)
A strong correlation exists between εr and frost susceptibility of unsaturated soils.

Salinity/Sulfates
J is a function of soil salinity, colloid content and temperature. The presence and fraction of sulfates is an important factor in determining if road subgrade can be stabilized with lime

Dielectric value (εr) measurements
- Measurement range varies according to probe type
- Measurement frequency: 40 - 50 MHz
- Measurement method: εr is measured through the change in the electrical capacity of the electrode (probe) attributable to the inflence of the material being measured. The term dielectric constant εr is used here to indicate the real part of the complex relative dielectric permittivity (εr).
- εr measurements are reliable when the conductivity of the material being measured is:
  < 1000 µS/cm for Tube Probe measurements
  < 2000 µS/cm for Surface Probe measurements

Conductivity (J) Measurements
- Measurement range: 0 to 9999 µS/cm
- Measurement frequency: 2 kHz square wave signal

Data storage, PC connection
- Number of measurements stored: 1000
- 24 calibrated probes can be attached to a Percometer:
- Data transfer to PC via RS232; modem optional

Power supply and battery management
The Percometer is powered by an internal 12 V, 1.5 Ah battery, which ensures a minimum of 8 hours continuous operating time. It can also operate using a +9 to +14 V external power supply.

GeoGauge®
Compaction Uniformity
via in-place Stiffness Measurement ASTM D6758

GeoGauge— H-4140

The GeoGauge is a unique, QC/QA field tool that can be used to measure the uniformity of unbound pavement layers by measuring the variability in stiffness throughout a structure. It is an excellent tool for identifying construction anomalies that would otherwise go undetected during construction where only density or percent compaction measurements were used. By measuring stiffness, the GeoGauge can reveal and thus help reduce variabilities in layer properties, which density measurements may miss, thus allowing corrective actions to be taken during construction to ensure that the highest quality base and subgrade are achieved despite variations in materials used.

The GeoGauge is the perfect companion instrument for density measuring devices such as nuclear gauges and the electrical density gauge. Density measuring devices can be used to ensure that proper compaction is achieved and the GeoGauge can be used to verify that the stiffness/modulus values assumed in the design specifications of new or rehabilitated pavement structures are met. Compacting and monitoring pavement layers directly to design requirements of structural layer stiffness or material modulus in addition to percent compaction during the construction process establishes the means to effectively control structural uniformity, strength and deflection, as well as enabling the monitoring and control of the construction quality of various materials. This leads to better smoothness and longer lasting pavement surfaces at lower cost.

The GeoGauge works by applying a vibrating force at 25 specific frequencies, which produce small deflections in the material. The resulting displacement is measured by the GeoGauge and displayed as stiffness determined by the ratio of the force to deflection. The GeoGauge produces stress and strain levels common for pavement, bedding and foundation applications.

In addition, Young's and shear modulus can be determined from GeoGauge measurements if a Poisson's ratio is assumed. This dynamic technology used by the GeoGauge simulates real in-use conditions. This factor allows the GeoGauge to directly measure in-place engineering properties during the construction process. The GeoGauge supports and directly links the in-place engineering properties of compacted materials with Mechanistic-Empirical Design for effective QC/QA. Successful control of compaction creates a quality functional structure with the desired engineering properties for the application and life intended.

Applications include subgrade, sub-base, base, monitoring the strength gain of lime, cement, fly-ash and polymer stabilized materials, monitoring the re-compaction of underground utility backfills to previous properties matching surrounding undisturbed materials, monitoring the compaction of asphalt and cold in-place recycling to peak properties to prevent wasted effort and damaging over-compaction.

Features include:

- Dynamically measures in-place engineering properties using structural layer stiffness, MN/m (klbf/in) and Young's Modulus of a material, MPa (kpsi)
- In-place QC/QA links compaction and material performance directly to design requirements while advancing Mechanistic-Empirical Pavement Design
- Enables maximum lift stiffness with minimum compactive effort
- Facilitates uniform stress transmission and distribution from pavement to subgrade resulting in longer pavement life, reduced maintenance costs and longer lasting surface smoothness.
- Enables reduced structural variability in construction
- In-place QC/QA of the strength gain of stabilized materials
- Data base development supporting Mechanistic-Empirical Design and performance specifications
- Portable, fast, simple, reliable, non-invasive
- Other compaction applications include: lime, cement, fly-ash and polymer stabilized materials, cement-treated and rehabilitated bases, large particle aggregate bases, as well as underground utility backfills
- Gauge includes simple, easy-to-use software application, which provides download and storage of test data. Application allows printing of data reports, as well as saving information in other fornats (.pdf, .csv and Rich Text) for importing data into other programs

Specifications

Layer Stiffness	17 to 400 klbf/in (3 to 70 MN/m)
Young's Modulus (in-place)	4 to 90 kpsi (26 to 610 MPa
Measuring Depth	9 to 12 inches (230 to 310 mm)
Measuring Duration	75 seconds
Power	six D-cell batteries (1000 to 1500 measurements)
Dimensions	gauge only: 11" dia. x 10.5" high (280 mm x 270 mm) carrying case: 18.5" x 16.5" x 13" (470 x 420 x 330 mm)
Net Weight	gauge only: 22 lbs. (10 kg) with case: 34 lbs. (15.5 kg)
Shipping Weight	39 lbs. (17.7 kg)

H-4140
Face Detail

Complies with ASTM D6758

H-4140.20

Accessories:

Verifier Mass, 10kg— H-4140.20
Verifies calibration of gauge.

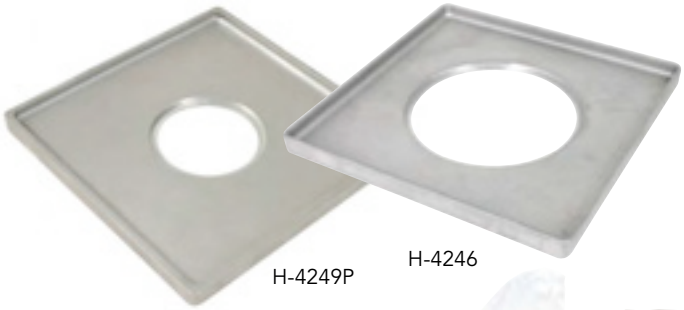
Calibration Platen, 10kg— H-4140.C
Platen used to allow gauge to self-calibrate. Guage is bolted onto platen with a torque wrench (included).

Infrared Data Cable— H-4140.12
Infrared (IR) serial interface adapter cable with spreadsheet software template

H-4140C

GeoGauge™— H-4140
includes: Gauge and hard carrying case.

H-4245
H-4249


H-4249P

H-4246

H-4238

H-3821

H-4117

H-4248

Density Apparatus— H-4245
Sand density apparatus determines the in-place density of soils. Set includes 1-gal. (3.79L) threaded jar, detachable double cone consisting of a brass cylindrical valve with a 1/2" (12.7mm) dia. orifice. Valve has stops that prevent rotating past completely open or completely closed positions. Bottom cone is 6-1/2" (165mm) dia. with a flanged opening that fits the opening of the H-4246 field density plate (order separately). Complies with ASTM D1556; AASHTO T191. Shipping wt. 10 lbs. (4.5kg)

Density Apparatus— H-4249
Similar to H-4245, but with 4-1/2" (114mm) dia. bottom cone, which has a flanged opening to fit the H-4249P field density plate (order separately). Shipping wt. 8 lbs. (3.6kg)

Field Density Plate— H-4246
Used with H-4245 density apparatus to simplify removal of soil from test mold and act as template to control hole diameter. Cast aluminum alloy. Size 12 x 12" (305 x 305 mm). Meets ASTM D1556; AASHTO T191.

Field Density Plate— H-4249P
Used with H-4249 density apparatus. Same as H-4246 Field Density Plate except with 4-1/2" (114mm) dia. hole.

Replacement Jar— H-4238
1-gal (4L) capacity threaded plastic replacement jar is same as furnished with H-4245 and H-4249.

Sand Density Cone— H-4248
For determining in-place density of gravel and coarse soils. Features two identical cones with a large valve between them and a circular density plate for support on the bottom. A clear plastic cover on the top cone allows for viewing sand flow. The unit also has handles for easier carrying. Flange that fits the lower cone allows apparatus to be used on holes up to 12" (305mm) dia. Complies with U.S. Army Corps of Engineers specifications. Shipping wt. 50 lbs. (22.7kg)

Density Sand— H-3821
Clean, dry, free-flowing uncemented sand has few, if any, particles passing the No. 200 (75mm) or retained on the No. 10 (2.00mm) sieves. The sand's variation in bulk density does not vary greater than 1 percent. Packaged in a box with a heavy reinforced inner bag. Complies with ASTM D1556; AASHTO T191. Shipping wt. 50 lbs. (22.7kg)

In-place Density Accessory Kit— H-4117
Accessory Kit for use with Sand Density Cones and Voluvessels. Includes: 100 Sample Bags and Ties, a pocket dial thermometer, a bristle brush, a stainless steel spoon, a steel chisel and a rubber mallet. Does not include sand.

H-4166
H-4167

H-4166S
shown w/
H-4166

H-4116

H-4196A
H-4190A

H-4193A
H-4194A

H-4166.10

H-4168

Control Unit
Close-up

Voluvessel, 1/20 cu. ft. (1600ml) capacity— H-4166
Voluvessel, 1/20 cu. ft. (1600ml) capacity— H-4116
Voluvessel, 1/13 cu. ft. (2230ml) capacity— H-4167
Voluvessels determine the in-place density of compacted or firmly-bonded soils using a rubber balloon apparatus viewed through a graduated, direct-reading clear plastic cylinder. Humboldt offers two distinctly different models; one, where the plastic cylinder screws into the density plate with the pump assembly mounted on top; and, the other, which has a metal casing protecting the plastic cylinder and the pump assembly mounted to the base.
Both designs come with a pressure-vacuum pump assembly, pressure gauge, quick coupler valve, double-graduated cylinder, 10 balloons and a density plate. Both designs comply with ASTM D2167; AASHTO T205.

Voluvessels are not suitable for soft soils that will deform under slight pressure or in which the volume of the hole cannot be maintained at a constant value.

Models H-4166 and H-4167 are individually calibrated before leaving the factory to ensure direct readings on the scale are accurate without the need for calculations.

Voluvessel Saddleweights— H-4166S
Weights used to ensure uniform and repeatable weight is applied during testing for accurate readings. Can be used with H-4166 and H-4167 Voluvessels.

Replacement Balloons, 10pk— H-4168

Replacement Pump Assembly— H-4166.10
Rubber-bulb, pump assembly for H-4166 and H-4167

Replacement Pump Assembly— H-4116.17
Rubber-bulb, pump assembly for H-4116

Clegg Impact Soil Tester
The Clegg Impact Soil Tester can test a full range of soils and soft rocks as encountered in the construction of flexible pavement and earthworks, as well as athletic fields and surfaces. It is useful for quickly checking variations during construction and monitoring changes over time due to seasonal environmental changes or road traffic, as well as testing natural and "as constructed" conditions. The Clegg can test a full range of natural and synthetic athletic surfaces where hardness/impact characteristics need to be controlled for safety or playability. The Clegg offers the convenience of rapidly scanning compaction variations over large areas. The Clegg may be transported and operated by one person, allowing for low cost, rapid field and laboratory testing and direct readout of the test results. In addition moisture measurements can be recorded using the optional H-4191A Moisture Probe with 20cm rods. Complies with ASTM standards D5874, F1702.0.

All units include the H-4198A Control Unit.

Clegg Impact Soil Tester Models

Size	Applications	Model
50mm 2.25 kg	Natural or synthetic soft turf, sand and golf greens turf (football, baseball, soccer fields, playgrounds,	H-4196A
50mm, 4.5 kg	Natural or synthetic turf (football, baseball, soccer fields, playgrounds, horse tracks, golf greens)	H-4190A
50mm 10 kg	Pre-constructed soils, trench reinstatement, bell	H-4193A
130mm 20 kg	Flexible pavement, aggregate road beds, trench reinstatement, bell holes, foundations	H-4194A

H-4219 (includes pelican case)

H-4219

Developed by the Army Corps of Engineers, Dynamic Cone Penetrometers (DCPs) provide a low-cost, efficient test method for quickly determining in-situ CBR values of pavement base, subbase and subgrades. They can readily be used for depths up to 30" and up to 6' with optional drive rods and extensions. All Models comply with ASTM D6951 specifications and come with a chart to compute CBR values, as well as an Excel spreadsheet template, which automatically charts the test results. DCPs cover a CBR range from <.05 to 100% and a bearing value range from 430 to 10,800 psf.

Dual-Mass Dynamic Cone Penetrometer— H-4219

The H-4219 is designed in strict adherence to all original design specifications including the overall weight of the unit set forth by the U.S. Army Corps of Engineers and ASTM D6951-03. The H-4219 features the exclusive easy-grip hammer that provides aa finger perch machined into the back side of the hammer flange, which provides easy, non-slip lifting when performing a test. It's exclusive coupling system ensures long-life of drive rods and extensions by providing a tight, positive connection every time, which eliminates the loss of hammer blow energy through the connections. While sold as a dual-mass model, the H-4219 can quickly be converted to a single mass unit by removing the hexagonal set screw and removing the outer sleeve from the dual mass hammer. This procedure can be accomplished during a test, since the outer sleeve is designed to slide over the DCP handle. The cone penetration caused by one blow of the 8 kg hammer is essentially twice that caused by one blow of the 4.6 kg hammer. As a result, the 4.6 kg hammer is more suitable for use and yields better test results in weaker soils having CRB of 10% or less. It can also be used for evaluating soils in foundations for residential structures which require bearing value of 2000 PSF (approximate CBR of 6%). The 8 kg hammer is preferable for high-strength soils, which it penetrates more quickly than the 4.6 kg hammer. However, the 4.6 kg hammer can be used on soils up to CBR 80%. The H-4219 includes a: dual-mass slide hammer assembly, a 1-meter drive rod with hardened tip, a 1-meter drive rod with disposable cone tip adapter, 100 disposable tips, vertical scale, go, no-go gauge, all necessary wrenches, user manual with spreadsheet software template and a heavy-duty, crush-proof Pelican carrying case. Shipping wt. 65 lbs. (29.5kg)

Additional disposable cones, adapters, and hardened points are available.

Economy, Dual-Mass DCP— H-4219E

The H-4219E includes a: dual-mass slide hammer assembly, a 1-meter drive rod with disposable cone tip adapter, 25 disposable tips, vertical scale, go, no-go gauge, all necessary wrenches, user manual with spreadsheet software template and a heavy-duty, crush-proof Pelican carrying case. Shipping wt. 65 lbs. (29.5kg)

Additional disposable cones, adapters, and hardened points are available.

H-4219.11

H-4219.10

H-4219.14

H-4219.100

H-4219.2

H-4219.4

Description	Model
Hardened cone tip w/wrench flats	H-4219.4
Disposable cone tip adapter w/wrench flats	H-4219.5
Disposable cones, pkg. of 100	H-4219.100
Disposable cones, pkg. of 25	H-4219.25
Std., 1 meter, threaded drive rod	H-4219.11
Std., 1 meter, disposable cone drive rod	H-4219.10
2 meter, disposable cone drive rod	H-4219.13
3 meter, disposable cone drive rod	H-4219.14
24" extension rod	H-4219.8
Vertical scale, 48"	H-4219.2
Go, No-Go Gauge	H-4219.3

H-4218C (includes pelican case)

H-4218C

H-4219.2

H-4218E

H-4219.4

H-4218B.800

H-4218.9

H-4219.100

H-4218B.450

H-4218B.150

H-4218B.170

H-4218B.130

H-4218B.135

Dual-Mass Dynamic Cone Penetrometer— H-4218C
The Standard DCP Kit measures the shear strength of soil with a CBR between 0.5-100% and from 430 to 10,800 psf. This single-operator kit is ideal for state/county/city highway departments and geotech firms. CBR and psf can be estimated in the field from tables in the manual and plotted using Corps of Engineers Excel template included on CD. It comes with a stainless steel dual-mass (17.6/10.1 lb) hammer and quick-connect upper rod, 30-inch drive rod (27-1/4 inch penetration), a 40-inch vertical scale, upper and lower scale mounts, a reusable hardened point and a disposable cone adapter with 25 disposable cones for fast and easy extraction of the instrument from hard/cohesive soil. The kit also includes a crush-proof Pelican carrying case with transport wheels and wrench set.
Shipping wt. 54 lbs. (24.5kg)

Economy, Single-Mass DCP— H-4218E
This Economy DCP Kit is used to estimate the shear strength of soil with a CBR between 10-100 and psf from 762-7072. Tables in the manual provide correlations to CBR and psf values for the penetration rates at 2 inch, 4 inch and 6 inch intervals. Affordably priced, this single-operator kit comes with a 37.75" drive rod that is marked in 2 inch increments, and a reusable hardened point. The single mass (17.6 lb) structural-steel hammer is standard with this kit. Also included are a manual, two Quick Connect pins and a wrench.
Please Note: The Economy DCP Kit DOES NOT come with a carrying case.

Description	Model
Hardened cone tip w/wrench flats	H-4219.4
Cone adapter with wrench flats (silver)	H-4218B.800
Disposable cones, pkg. of 25	H-4218.9
Disposable cones, pkg. of 500	H-4218.950
Hardened point with wrench flats (gold, Old)	H-4218.7
Cone adapter with wrench flats (gold, Old)	H-4218.8
Drive rod, 12" stainless	H-4218B.150
Drive rod, 30" stainless	H-4218B.130
Drive rod, 37.75" stainless	H-4218B.135
Extension rod, 24" stainless	H-4218B.170
Vertical scale, 48"	H-4219.2
Vertical scale, upper attachment	H-4218.530
Vertical scale, foot	H-4218.510
Quick connect, pin with clip (2 ea.)	H-4218B.450

H-4202A

H-4202.7A

H-4202.1A

H-4218F

Dynamic Cone Penetrometer Test Set— H-4202A
The Dynamic Cone Penetrometer (DCP), originally developed by George Sowers, uses a 15 lb steel mass falling 20 in. to strike an anvil to penetrate a 1.5 in. diameter 45° (vertex angle) cone that has been seated in the bottom of a hand-augered hole. The DCP can be used effectively in augered holes in nearly all types of soils to depths of 15 to 20 ft. (4.6 to 6.1m). Components are zinc-plated and cones are heat-treated. The cone can be replaced with a Drive Tube Assembly (H-4202.7A) for collection of 3 x 10 in (7.6 x 25.4 cm) tube samples from hand-augered holes.

The H-4202 set includes; (1) standard hammer assembly (H-4202.1), (1) heat-treated 45° cone penetrometer point with a 1 ft. adapter rod (H-4202.3), (4) 2.5 ft. E drill rod extensions (H-4202.225), (1) auger head (H-4202.6), (1) auger T-handle (H-4202.4), (4) 36" auger extensions (H-4202.5), and (1) ASTM special technical publication #399 (H-4202.9). Shipping wt. 76 lbs. (34kg)

DCP Test Set with Sleeved Drive Hammer— H-4202AS
The 4202 DCP Test Set with a H-4202.1A Sleeved Drive Hammer in place of the standard drive hammer. Provides an easier and safer-to-use hammer. Shipping wt. 80 lbs. (36kg)

Sleeved Drive Hammer— H-4202.1A
Alternate hammer for H-4202 DCP set. Provides an easier and safer-to-use hammer. Shipping wt. 32 lbs. (15kg)

DCP Test Set without Auger Set— H-4202AX
The H-4202X DCP Test Set without the auger set. The H-4202 set includes; (1) standard hammer assembly (H-4202.1), (1) heat-treated 45° cone penetrometer point with a 1 ft. adapter rod (H-4202.3), (4) 2.5 ft. E drill rod extensions (H-4202.225)

Sleeved Hammer DCP Test set w/o Auger Set— H-4202SX
The H-4202SX DCP Test Set without the auger set. The H-4202 set includes; (1) Sleeved Drive Hammer assembly (H-4202.1A), (1) heat-treated 45° cone penetrometer point with a 1 ft. adapter rod (H-4202.3), (4) 2.5 ft. E drill rod extensions (H-4202.225)

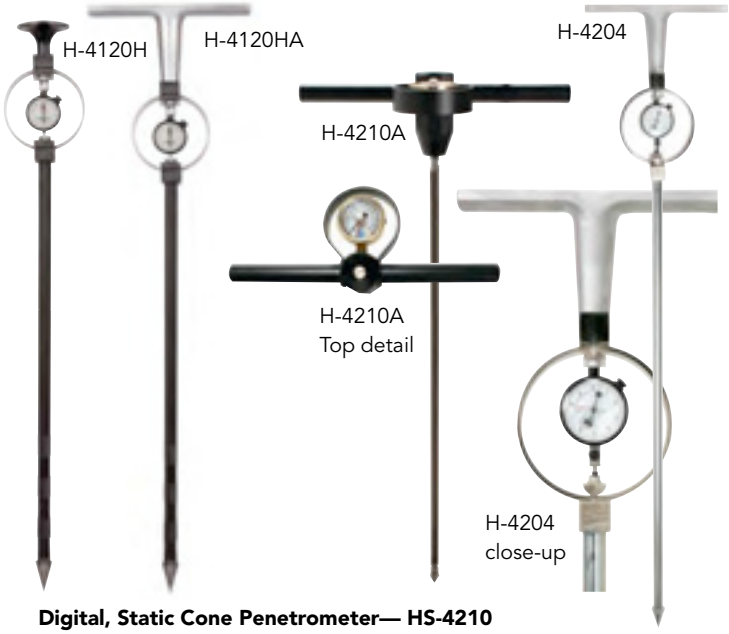
Shelby Tube Drive Head— H-4202.7A
Drive Head for Shelby tubes for use with H-4202.1 or H-4202.1A Drive Hammers with 3" "E" rod connection.

Individual Items for H-4202

Description	Model
Standard drive hammer	H-4202.1
Sleeved drive hammer	H-4202.1A
E drill rod extension 1 ft.	H-4202.21
E drill rod extension 2 ft.	H-4202.22
E drill rod extension 2.5 ft.	H-4202.225
E drill rod extension 5 ft.	H-4202.25
Drive point w/1 ft. adapter (45° cone)	H-4202.3
Drive point only (45° cone)	H-4202.3DP
Auger assembly, includes auger head, two connector pins, tee handle and one extension.	H-4202.6A
Auger Tee handle	H-4202.4
Auger Tee handle, stainless steel	H-4202.4SS
Auger extension. 36"	H-4202.5
Auger extension, stainless steel. 36"	H-4202.5SS
Auger head, standard 3-1/4"	H-4202.6
Auger head, stainless steel 3-1/4".	H-4202.6SS
Windowed auger head, standard (heat-treated carbon steel). 3-1/4"	H-4202.6W
Windowed auger head, standard (stainless steel) 3-1/4"	H-4202.6WSS
Shelby Tube Drive Head, 3" E Rod	H-4202.7A
Replacement connector pin.	H-4202.8
Replacement connector pin, stainless steel.	H-4202.8SS
ASTM special technical publication #399	H-4202.9

Single-Mass (10.1 lbs) DCP— H-4218F
The H-4218F is used to estimate the shear strength of very weak soil with a CBR less than 20 and psf less than 4000. Tables in the manual provide correlations to CBR and psf values for the penetration rates at 2", 4" and 6" intervals. Affordably priced, this kit comes with a 37-3/4" drive rod that is marked in 2" increments, a single mass structural steel hammer and a reusable, hardened point. Also included are a manual, two quick-connect pins, two wrenches and 3-in-1 oil.
DOES NOT come with a carrying case. Shipping wt. 22.5 lbs. (10kg)

24" Extension Rod— H-4218F.24



Heavy-Duty Dynamic Cone Penetrometer— H-4223

The Heavy Duty DCP permits rapid and economical evaluation of soils while providing information on soil stratification. The DCP is commonly used for footing evaluations and can also be used to evaluate fill when compaction must be verified. This tool consists of a sliding hammer assembly with a 10-pound hammer that is dropped 24 inches. The slide hammer shaft is machined from one piece of alloy steel. Both the hammer shaft and hammer are heat treated to ensure long life. This device uses a 36" Extension Shaft that is .875" diameter, with 6" increments marked along its length. There is a 60-degree, hardened-cone tip that is 1.125" diameter. Having a larger diameter cone than the diameter of the shaft helps reduce side friction along the length of the extension shaft. Extension shafts may be attached end-to-end to achieve a depth of 9 feet. This set consists of: (1) Slide Hammer Assembly; (1) 36" Lower Extension Shaft With Hardened Cone Tip; (1) 36" Lower Extension Shaft With Threaded End for 72" Depth of Test; (1) Heavy duty Pelican carry case with custom inserts. The set also includes all necessary tools for easy assembly and disassembly and a complete User and Maintenance Manual.

We strongly advise hand augering a hole first when going beyond 6 feet. Refer to ASTM Special Publication No. 399 for insight into DCP use and practices

Individual Items for H-4223

Description	Model
Sliding drive hammer assembly	H-4223.1
Extension Shaft, 36 inches	H-4223.2
Extension Shaft, 24 inches	H-4223.4
Cone Tip, 60°, Hardened Steel	H-4223.3

Corps of Engineers Cone Penetrometer— H-4120H
COE Cone Penetrometer w/ T-Handle— H-4120HA

Designed to evaluate soil trafficability and manufactured to Corps of Engineers specifications. The factory calibrated dial indicator reads directly in psi. Includes 30 degree cone with 1/2 sq. in. base area; 150 lb capacity proving ring; a dial indicator calibrated direct 0–300psi in 5psi increments; extension rod 5/8" (15.8mm) dia x 19" (483mm), and the handle. Shipping wt. 15 lbs. (6.8kg)

Digital, Static Cone Penetrometer— HS-4210

The HS-4210 Digital, Static Cone Penetrometer (DSCP), with its large, digital readout, makes testing and recording readings easy. The DSCP can be used to evaluate soil consistency by determining the soil's level of compaction and/or the bearing capacity. The DSCP is especially useful in evaluating shallow foundations and pavement subgrades where fine-grained and soft soils are being used. The DSCP can also be used to aid technicians in quickly selecting sites for testing, as well as correlating with other tests, based on local conditions, such as standard or modified Proctor, CBR or Bearing Capacity. The DSCP uses a dual-rod design, which eliminates the need to correct for soil friction on the rod as the cone is pushed through the material. Penetration resistance is read directly from the cone tip and registered on the digital display. The Unit comes with a 30" starter rod and a 60° cone with a 1.5cm^2 area. Shipping wt. 9 lbs. (4kg)

Static Cone Penetrometer— H-4210A

Used in fine-grained, soft soils at shallow foundation and pavement subgrades to evaluate for soil consistency, level of compaction and bearing capacity. Unmatched for accuracy, reliability and ease of use. Pressure gauge with 0-70kg/cm is scaled for direct reading of cone stress, eliminating proving ring conversions. Dual rod design eliminates soil friction factor. High strength aluminum and steel construction. Standard model includes a 60° cone with 1.5cm. max. area, a 24" (0.6m) starter rod assembly rated at 250 lbf axial force max., and a pressure gauge. Shipping wt. 8 lb. (3.63kg)

Individual Items for H-4210A

Description	Model
60° Cone with 3cm^2 max area	H-4210.3
Extension rod, 24 in. (0.6m)	H-4210E.2A
60° Cone with 1.5cm^2 max area	H-4210.1
Starter rod, 24 in. (0.6m)	H-4210.2A
Replacement O-ring	H-4210.9

Proving Ring Penetrometer— H-4204

Used to determine the bearing capacity of subgrades, or to measure soil compaction. Light and easy to handle in the field. A rapid means of determining the penetration resistance of soil in shallow exploration surveys. Includes: 30°, 1 sq. in. (6.45 sq cm) cone; 250 lb. (1.1kN) capacity proving ring; brake type dial indicator, holds final reading until manually released; 3/4" (19mm) dia shaft, graduated at 6", (152mm) intervals; 3/4" (19mm) dia extension rod, graduated at 6" (152mm) intervals; cast aluminum T-handle. Shipping wt. 15 lbs, (6.8kg)

Probe Rod— H-4188
Ideal for locating buried pipes, tanks and utility lines. Zinc-plated steel, 36" (914mm) x 1/2" (12.7mm) shaft. Shipping wt. 5 lbs. (2.2kg).

Fiberglass Probe Rod— H-4188F
Ideal for locating buried pipes, tanks and utility lines. Light, non-conductive Fiberglass 48" (1219mm) x 1/2" (12.7mm) shaft.

Spiral Type Auger— H-4250
For use in sampling soils, auger has 1-1/2" dia. x 4" long (38mm x 102mm) spiral-type auger bit. Features graduation marks every 6" (152mm). Overall length is 36" (914mm), including handle. Screw-on handle permits attachment of H-4251 extension for sampling beyond 36" depths. Complies with ASTM D420, D1452; AASHTO T86, T202. Shipping wt. 6 lbs. (2.7kg).

Extension for Spiral Type Auger— H-4251
For use with H-4250 auger, 36" (914mm) long extension allows sampling at greater depths. Shipping wt. 5 lbs. (2kg)

Soil Sampling Tube— H-4362
For use in collecting soft soil samples in 3/4" core sample size. Depth capacity is about 39". Includes sampler tube, one tip, two extension rods, handle and fiberboard case.

Auger Set with Quick-release Handle and Bucket— H-4202.6A
Set includes a 3-1/4" Windowed, Auger Head of zinc-plated steel, Auger Tee Handle, 36" (914mm) Auger Extension and (2) Quick-release Connector Pins.

Auger Extension, 36"— H-4202.5
Auger Extension and Connector Pin for use with H-4202.6A Auger Set.

Iwan-Type, T-Handle Auger, 2" dia (51mm)— H-4252.2

Iwan-Type, T-Handle Auger, 3" dia (76mm)— H-4252.3

Iwan-Type, T-Handle Auger, 4" dia (102mm)— H-4252.4

Iwan-Type, T-Handle Auger, 6" dia (152mm)— H-4252.6
T-handle augers are also known as post-hole, Iwan-type or non-adjustable augers. Feature 36" (914mm) long steel shaft and hardwood cross handle. Available 2" (51mm) to 6" (152mm) diameter. Overall length 48" (1219mm). Complies with ASTM D420, D1452; AASHTO T86, T202. Shipping wt. 7 lbs. (3.2kg).

Extension for 2" Iwan-Type Auger— H-4252.2E
For use with H-4252.2 T-handle auger only, extension is 36" (914mm) long and includes end coupling. Shipping wt. 9 lbs. (4.1kg).

Extension for 3", 4" and 6" Iwan-Type Auger— H-4252E
For use with H-4252.3, H-4252.4 and H-4252.6 T-handle augers, extension is 36" (914mm) long and includes end coupling.

Soil Sampling Tube Set— H-4269
Tube sets are helpful and functional for agricultural and other soil-testing procedures. Sampling tube will produce 15" (381mm) core of soil. Includes 18" (457mm) long, 7/8" (22mm) ID sampling tube, handle and carrying case.

Soil Sampling Auger Tube Set— H-4268
Set contains auger and sampling tube. Components are plated steel to resist abrasive action of soil. Includes 1-1/4" (25mm) dia. by 12-1/2" (318mm) long auger, 1" (approx. 25mm) OD by 12-1/2" (318mm) long sampling tube, two 12" (305mm) extension rods, handle and a fiberboard carrying case. Shipping wt. 7 lbs. (3.2kg).

Augers, Bucket-Type, Quick-connect
Quick-connect, button-and-hex coupling system allows components to connect and disconnect faster and with less hassle than threaded systems. Quick-connect connections, are not compatible with slide hammers. Bucket augers offer outstanding durability and allow access to deeper depths. The regular auger bit is designed for ordinary soil sampling. The sand auger bit is used for dry, sandy soils. Mud auger bits are designed for sampling heavy, wet soil or clay samples; opening facilitates removal of wet samples. Heat treated, high carbon steel bits with tungsten carbide hard-surfaced edges. Bits are welded to a stainless steel cylinder, topped with a carbon steel ball.

Augers, Bucket-Type, Quick-connect			
Size	**Regular**	**Sand**	**Mud**
2"	H-4410QC	H-4430QC	H-4420QC
2-1/4"	H-4411QC	H-4431QC	H-4421QC
2-3/4"	H-4412QC	H-4432QC	H-4422QC
3-1/4"	H-4413QC	H-4433QC	H-4423QC
4"	H-4414QC	H-4434QC	H-4424QC

Auger Extensions, Quick-connect	
Description	Model
2 ft. (610mm), Chromoly Extension	H-4442QC
3 ft. (914mm), Chromoly Extension	H-4443QC
4 ft. (1219mm), Chromoly Extension	H-4444QC
5 ft. (1524mm), Chromoly Extension	H-4445QC

H-4447QC

H-4449QC

Auger Cross Handles, Quick-connect	
Auger Cross Handle, Padded	H-4447QC
16" Ratcheting Handle	H-4449QC

Augers, Bucket-Type, 5/8" Threaded
Threaded connections use standard, national course, threads. 5/8" connections are the most common and least expensive. Augers, core samplers, probes, slide hammers, hammer-head handles, and kits are available with threaded connections. Bucket augers offer outstanding durability and allow access to deeper depths. The regular auger bit is designed for ordinary soil sampling. The sand auger bit is used for dry, sandy soils. Mud auger bits are designed for sampling heavy, wet soil or clay samples; opening facilitates removal of wet samples. Heat treated, high carbon steel bits with tungsten carbide hard-surfaced edges. Bits are welded to a stainless steel cylinder, topped with a carbon steel ball.

Augers, Bucket-Type, 5/8" Threaded			
Size	**Regular**	**Sand**	**Mud**
2"	H-4410TH	H-4430TH	H-4420TH
2-1/4"	H-4411TH	H-4431TH	H-4421TH
2-3/4"	H-4412TH	H-4432TH	H-4422TH
3-1/4"	H-4413TH	H-4433TH	H-4423TH
4"	H-4414TH	H-4434TH	H-4424TH

Auger Extensions, 5/8" Threaded	
Description	Model
2 ft. (610mm), Chromoly Extension	H-4442TH
3 ft. (914mm), Chromoly Extension	H-4443TH
4 ft. (1219mm), Chromoly Extension	H-4444TH
5 ft. (1524mm), Chromoly Extension	H-4445TH

H-4447TH

H-4449TH

Auger Cross Handles, 5/8" Threaded	
Auger Cross Handle, Padded	H-4447TH
16" Ratcheting Handle	H-4449TH

H-4451

H-4452

H-4449

Basic Soil Sampling Kits

Basic sampling kits provide everything you'll need to auger to a target depth as deep as 12ft and obtain a relatively undisturbed soil core sample. The kits are used worldwide by construction companies, consultants and engineering firms for site investigations. They are available with 5/8" threaded components with either 2-1/4" or 3-1/4" augers. Each kit comes with (1) regular, (1) mud, and (1) sand auger. The kits also include (3) 4' extensions, (1) 18" rubber-coated cross handle, (1) regular slide hammer, (1) core sampler (1-1/2" x 6" or 2" x 6"), (1) plastic liner, (2) plastic end caps, (1) cleaning brush, (1) universal slip wrench, and (2) cresent wrenches. All the components fit securely in a foam-lined, poly-reinforced deluxe carrying case with handles and wheels for added portability.

5/8" Threaded Soil Auger Kits

Description	Model
2 1/4" Basic Soil Sampling Kit (56.0 lb)	H-4416.2
3 1/4" Basic Soil Sampling Kit (60.0 lb)	H-4416.3

Rock Breaker and Slide Hammers

Rock Breaker is made from high-strength alloy steel with chisel tip. Use with Slide hammers for rock breaking and chiseling. Rubber coating on slide hammers makes them easy to hold on to and absorb impact shock. **Slide hammers have 5/8" threaded coupling, order adapter listed below to use with quick-connect rock breaker and extensions.**

Rock Breaker and Slide Hammers

Description	Model
Rock Breaker with Chisel Tip	H-4449
Regular Slide Hammer, 5/8" Threaded	H-4451
Compact Slide Hammer, 5/8" Threaded	H-4452
Universal Slip Wrench	H-4453

Soil Auger Kits

These are complete, compact setups for augering to depths of 12' or 16'. Soil auger kits include (1) regular and (1) mud auger, (4) extensions, an 18" rubber-coated cross handle, and a flexible, poly-canvas carrying case for easy transport and storage. They are available with either 5/8" threaded, or quick-connect connections.

Quick-connect Soil Auger Kits

Description	Model
2 1/4" Augers with (4) 3' Extensions (19.0 lb)	H-4418.23
2 1/4" Augers with (4) 4' Extensions (22.0 lb)	H-4418.24
3 1/4" Augers with (4) 3' Extensions (19.0 lb)	H-4418.33
3 1/4" Augers with (4) 4' Extensions (22.0 lb)	H-4418.34

5/8" Threaded Soil Auger Kits

Description	Model
2 1/4" Augers with (4) 3' Extensions (19.0 lb)	H-4419.23
2 1/4" Augers with (4) 4' Extensions (22.0 lb)	H-4419.24
3 1/4" Augers with (4) 3' Extensions (19.0 lb)	H-4419.33
3 1/4" Augers with (4) 4' Extensions (22.0 lb)	H-4419.34

See Page 21 for Extensions

H-4203DT.3

H-4203DT.4

H-4203.4

H-4203.3

42 Inch, Snap-On Augers

Description	Model
1-1/2" (38mm) Snap-on auger	H-4052A.1
2" (51mm) Snap-on auger	H-4052A.2
3" (76mm) Snap-on auger	H-4052A.3
4" (102mm) Snap-on auger	H-4052A.4
6" (152mm) Snap-on auger	H-4052A.6

42" augers dig a 36" deep hole.

36 Inch, Full-flighted, Snap-On Extensions

Description	Model
1-1/2" (38mm) Snap-on extension	H-4053.1
2" (51mm) Snap-on extension	H-4053.2
3" (76mm) Snap-on extension	H-4053.3
4" (102mm) Snap-on extension	H-4053.4
6" (152mm) Snap-on extension	H-4053.6

Tube Extensions

Description	Model
36" Tube extension for 3 to 6" Augers	H-4053.7
18" Tube extension for 3 to 6" Augers	H-4053.8

Replacement Points & Blades

Description	Model
1-1/2" (38mm) Screw-on replacement point	H-4055.1
2" (51mm) Screw-on replacement point	H-4055.2
3" (76mm) Screw-on replacement point	H-4055.3
Replacement point, 4" (102mm) or 6" (152mm)	H-4055
Replacement blade, 4" (102mm)	H-4056
Replacement blade, 6" (152mm)	H-4057

Power Mechanical Earth Drill, 5hp— H-4050
Power Mechanical Earth Drill, 8hp— H-4051
For soil sampling, construction and more, earth augers are gasoline powered and portable. Using one operator, they allow fast and easy drilling. They feature snap-on or screw-on augers and extensions. Engine mounted on wheel-base carrier keeps motor noise and fumes away from the operator. Torque tube eliminates counter torque. Features such as the carrier and torque tube offer greater mobility, beneficial in areas inaccessible to large equipment, on slopes and horizontal drilling, various standard sampling methods to obtain material samples. Recoil starter and spring-loaded throttle-in-handle assembly provide fingertip control. Centrifugal clutch, heavy-duty flexible shaft connects to the motor and provides for a smooth operation. Blades and points are tool steel, hard-surfaced and heat treated. Blades are reversible for longer life. Most augers are snap-on design; smaller diameter augers are screw-on. Auger has either 5HP or 8HP, 4-cycle engine with 10:1 gear ratio, complete with wheel kit and torque tube. Order augers and extensions separately. For augers 1-1/2" to 6" dia., maximum depth is 18' (38 to 152mm, 5.5m deep). Shipping wt. 225 lbs. (102kg)

Density Drive Sampler, 3" (76.2mm) Drive Head— H-4203.3
Density Drive Sampler, 4" (101.6mm) Drive Head— H-4203.4
For determining in-place density of soil by driving a thin-walled tube into the soil mass to obtain a relativity undisturbed sample. Typically used to verify compacted fill placement, or to obtain samples from the bottom of shallow excavations. Zinc-plated, steel drive head and sliding weight hammer used with separately ordered drive tubes. Drive head, 10 lb., has shock reducing spring to guard against fatigue failure. Complies with ASTM D2937. Shipping wt. 25 lbs. (11kg)

Drive tube for use with H-4203.3 Drive Sampler— H-4203DT.3
3" (76.2mm) x 2.75" (69.9mm) length, (3" x 0.01 ft^3).

Drive tube for use with H-4203.4 Drive Sampler— H-4203DT.4
4" (101.6mm) x 5" (127mm) length, (4" x 0.033 ft^3).

Testing Equipment for Construction Materials
HUMBOLDT

Humboldt Soil Penetrometer (Tire Gauge Design)— H-4200
For use by field personnel to check visual classification of soils. Verifies whether excavation side walls require shoring, based on OSHA cohesive soils classifications. Indicates consistency, shear strength, and approximate unconfined shear strength. Direct-reading scale—in tons/sq ft, or kg/sq cm—corresponds to equivalent unconfined compressive strength. Range: 0 to 4.5 tons. High quality construction. Includes belt-loop style carrying case and operating instructions. Should not replace laboratory testing or field analysis, or be used to produce foundation design data. Shipping wt. 1 lb. (.5kg)

Soil Penetrometer, Pocket Type— H-4195
For use by field personnel to check visual classification of soils. Verifies whether excavation side walls require shoring, based on OSHA cohesive soils classifications. Indicates consistency, shear strength, and approximate unconfined shear strength. Direct-reading scale—in tons/sq ft, or kg/sq cm—corresponds to equivalent unconfined compressive strength. Indicator sleeve retains reading after piston is released.

Penetrometer Adapter Foot— H-4200F
Adapter foot is recommended when testing extremely low strength cohesive soils. 1" (25mm) dia. foot, compared to the 1/4" (6.35mm) penetrometer piston, increases the effective area measured by 16 times. Divide by 16 to obtain correct unconfined compressive strength when the reading in tons per square foot or kilograms per square centimeter is on the low-load side. Shipping wt. 1 lb. (.5kg)

Pocket Shear Vane, Metal— H-4212MH
The Humboldt H-4212MH Pocket Shear Vane Tester provides a quick and efficient method for determining shear strength values of cohesionless soils. The Pocket Shear Vane is widely used for taking on-site measurements of excavations, including trenches and test pits. It is also used for taking readings from thin-wall or split core soil samples. It can also be used in the laboratory for evaluaitons. The device is widely used by Safety and OSHA Inspectors, Back Hoe Operators, Field Testing Technicians, Consulting Engineers, etc.

The Humboldt Shear Vane Device comes with three vanes, which are easily attached or removed from the device with the included L-wrench. We also include a custom, heavy-duty, nylon bag for storage, which can be quickly attached to your belt with its belt clip, as well as a laminated instructions card, so you always have instructions to refer to when doing tests.

The Pocket Shear Vane can be used to gather a large number of readings including those from different failure planes without the need to prepare and trim samples. The device can be used on any reasonably flat surface that is slightly larger than the vane surface being used. The Pocket Shear Vane can be used with fully-saturated, fine-grained soils with an undrained strength independent of normal pressure, including a wide range of clays from soft to stiff consistency. Readings can be made from 0 to 2.5 TSF (1 Kg/cm2). The dial on the unit reads in 0.05 TSF (0.05 Kg/cm2) increments.

Torvane Shear Tester Set, Plastic— H-4212
Similar to H-4212MH, but made of plastic. Comes in plastic case.

Dial Pocket Penetrometer Kit— H-4205
A sophisticated pocket penetrometer offering greater capacity and sensitivity than others. Maximum value is retained on the dial until released via push-button. Inner dial scale 0 to 6.0, with 0.1 divisions in tsf and kg/cm^2. Outer scale gives load strength over 0 to 11.0 with 0.1 divisions in kg. This reading is used with charts (included) to estimate safe bearing pressures, depending on plunger used and soil type. Values indicated relate to the standard 1/4" dia. plunger. In addition, readings with four other included plungers (10, 15, 20, 25mm) indicate safe bearing pressures for foundations in consolidated soils over a range of sandy to clay-type soils. The 2.5" (63mm) dia. dial can be easily recalibrated using register plates (included) and any readable scale of 10-15 lbs. capacity. Includes data tables, register plates, instructions, and carrying case. Shipping wt. 2 lb. (1kg)

Vane Inspection Set— H-4227
The Vane Inspection Set provides a rapid check of the stability of foundations, excavations and trenches in clay. The total range is 0 to 260kPa (0 to 2.6 ton/sq. ft.). The scale built into the handle holds the peak value until reset. Accuracy is ±10%. Three different sizes vanes are included with the set (16 x 32, 20 x 40 and 25.4 x 50.8mm). The effective ranges are 0 to 260, 0 to 130 and 0 to 65kPa (0 to 2.6, 0 to 1.3 and 0 to 0.65 tsf). A "dummy" vane is also included to calibrate the six 0.5 meter long extension rods for effects of soil friction. All items come in a compartmentalized vinyl carrying case with three wrenches. Shipping Weight: 13 lb (6kg).

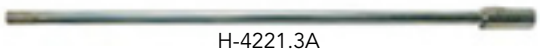
Extension rod, 0.5 meter— H-4227.1

50.8 x 101.6mm Vane— H-4227.2
Measuring range is 0 to 8.125kPa (0.08 TSF)

H-4221

H-4139

H-4221.1


H-4221.3A

H-4368A

H-4040.150

Geovane Soil Shear Strength Tester— H-4221
The Geovane is a hand-held instrument used for determining soil shear strength providing the reading in kPa. The device is simple to use. A 19mm vane blade is screwed into the base of the Geovane and the vane is pushed into the soil. Simply rotate the Geovane at a rate of 1 revolution per minute and take a reading off the face when the soil fails. The pointer stays in place when failure occurs allowing you to look up the indicated reading on the supplied calibration chart to get your reading in kPa from zero to 200. Through the use of the optional 33mm vane, readings can be measured between the range of zero to 40 kPa. Extension rods are available to increase the depth measurement capabilities of the unit. The H-4221.4 Adapter is needed to attach extension rods to the Geovane. The Geovane is supplied complete with a 19mm vane blade, wrenches and a carrying case.
Shipping Weight: 6 lb (3kg).

Vane Blade (33mm)— H-4221.1

Extension Rod 12" (300mm)— H-4221.2A

Extension Rod 19.7" (500mm)— H-4221.3A

Extension Rod Adapter— H-4221.4

Proctor Penetrometer Set— H-4139
Establishes the moisture-penetration resistance relations of fine-grained soils. Includes these interchangeable needles (area in sq. in. or sq. cm): 1 (6.45), 3/4 (4.84), 1/2 (3.22), 1/3 (2.15), 1/5 (1.29), 1/10 (.65), 1/20 (0.32) 1/30 (0.22cm^2) and 1/40 (0.16cm^2). Replacement needles available. Complies with ASTM D1558. Shipping wt. 17 lbs. (7.7kg).

Penetration Resistance Needles for H-4139

Description	Model
Replacement Resistance Needle Set	H-4143N
1 sq. in. (6.45 cm^2) needle	H-4143.1
3/4 sq. in. (4.84 cm^2) needle	H-4143.75
1/2 sq. in. (3.22 cm^2) needle	H-4143.50
1/3 sq. in. (1.29 cm^2) needle	H-4143.33
1/5 sq. in. (2.15 cm^2) needle	H-4143.20
1/10 sq. in. (0.65 cm^2) needle	H-4143.10
1/20 sq. in. (0.32 cm^2) needle	H-4143.05
1/30 sq. in. (0.22 cm^2) needle	H-4143.033
1/40 sq. in. (0.16 cm^2) needle	H-4143.025

Soil Color Charts— H-4368A
The Munsell Soil Color Charts are an affordable way to evaluate the type of soil that is present within a given area. The book is set up to allow users to make soil color evaluations in the field quickly and easily. Through the use of the Munsell Soil Color Charts, practitioners from a wide range of professions can share reliable and consistent information about the color of soils at a particular site with colleagues anywhere around the world. The new soil book contains all of the colors that have been available in the past plus these additional pages:

- Munsell high value, low chroma 'White' Page, used for describing carbonate, silica, gypsum, and soluble salt precipitates and evaporites common to arid and semi-arid environments and very light-colored parent materials, such as diatomaceous earth and volcanic ash. The White Page shows half steps from 8.5 to 9.5 in value with chromas of 1 and 2 for N, 7.5 YR , 10YR, and 2.5Y
- 10Y and 5GY Soil chart for glauconitic soils
- 5R soil chart for Australia and Southeast Asia

Shipping wt. 1 lb. (.5kg)

Water Level Indicator, 150 ft.— H-4040.150

Water Level Indicator, 300 ft.— H-4040.300

Water Level Indicator, 500 ft.— H-4040.500

Water Level Indicator, 50 meters— H-4040.50M

Water Level Indicator 100 meters— H-4040.100M

Water Level Indicator, 150 meters— H-4040.150M
The Water Level Indicator determines water levels in drainage operations, dams, reservoirs, embankments, wells, bore holes, underground cavities, or any hydrological/geological work. Works well with small openings, holes & shafts that are not always straight. Compact, self-contained units feature a jointed design for easy access to difficult openings. Weighted probe is lowered into the opening via high-strength, flexible cable. Buzzer & light indicate when water level has been reached. Readings taken from marked cable to very tip of probe so less than 1 ml of water is displaced. Probe resists false readings caused by cascading water. Standard models have cables marked in feet, metric models marked in centimeters. Shipping wt. 6-12 lbs. (3-5kg)

Shelby Tubes

H-4202.7A

H-4202.7A mounted to a H-4202.1 Drive Hammer and a 10" Shelby Tube

H-4210.3AW

H-4210W

H-4210.5P
H-4210.25P

H-4210C

H-4210.005C
H-4210.003C

Sealing Wax— H-4210W
Sealing wax to seal ends of Shelby Tube for transport. 10 lb. box.
For Melting Pots, please see page 109.

Shelby Tube Drive Heads For Use with Drill Rigs—
These Drive Heads feature internal floats to relieve water pressure while taking samples in submerged applications, but can be used in all applications. Available for use with AW, AWJ and NW drill rods.

Description	Model
2" Drive Head for AW Rod (wt.4lbs)	H-4210.2AW
2" Drive Head for AWJ Rod (wt.5lbs)	H-4210.2AWJ
2.5" Drive Head for AW Rod (wt.6lbs)	H-4210.25AW
3" Drive Head for AW Rod (wt.13lbs)	H-4210.3AW
3" Drive Head for AWJ Rod (wt.11lbs)	H-4210.3AWJ
3" Drive Head for NW Rod (wt.9lbs)	H-4210.3NW
3.5" Drive Head for NW Rod (wt.10lbs)	H-4210.35NW
5" Drive Head for NW Rod (wt.28lbs)	H-4210.5NW

Shelby Tube Caps
Plastic end caps for for protecting tube and sample.

Description	Model
2" Plastic End Cap for Shelby Tube	H-4210.2C
2.5" Plastic End Cap for Shelby Tube	H-4210.25C
3" Plastic End Cap for Shelby Tube	H-4210.3C
3.5" Plastic End Cap for Shelby Tube	H-4210.35C
5" Plastic End Cap for Shelby Tube	H-4210.5C

Expansion Packers—
Expanding plugs to seal samples in Shelby tubes for transport.

Description	Model
2" Expansion Packer	H-4210.2P
2.5" Expansion Packer	H-4210.25P
3" Expansion Packer	H-4210.3P
3.5" Expansion Packer	H-4210.35P
5" Expansion Packer	H-4210.5P

Shelby Tube Travel Case for (12) 3" Shelby Tubes— H-4210.003C
Shelby Tube Travel Case for (9) 5" Shelby Tubes— H-4210.003C
High-quality road cases for transporting shelby tubes. Ensures upright storage and shipment for undisturbed soil samples. Please enquire for cases for other size tubes, as well as custom configurations.

Shelby Tubes, Galvanized—
Shelby tube samplers are thin-walled, hollow steel tubes, which are driven into the ground to extract a relatively undisturbed soil sample for use in laboratory tests used to determine density, permeability, compressibility and strength. Each tube has one end that is chamfered to form a cutting edge and the upper end includes holes for securing the tube to a drive head. Shelby tubes are useful for collecting soils that are particularly sensitive to sampling disturbance, including fine cohesive soils and clays. The tubes can also be used to transport samples back to the lab as well.

Description	Model
2" dia x 30" long, galvanized shelby tube (wt.2.5lbs)	H-4210.230
2" dia x 36" long, galvanized shelby tube (wt.3.2lbs)	H-4210.236
2.5" dia x 30" long, galvanized shelby tube (wt.4.2lbs)	H-4210.253
2.5" dia x 36" long, galvanized shelby tube (wt.5.5lbs)	H-4210.256
3" dia x 10" long, galvanized shelby tube (wt.1.9lbs)	H-4210.10
3" dia x 12" long, galvanized shelby tube (wt.1.9lbs)	H-4210.12
3" dia x 18" long, galvanized shelby tube (wt.3.0lbs)	H-4210.18
3" dia x 24" long, galvanized shelby tube (wt.3.8lbs)	H-4210.24
3" dia x 30" long, galvanized shelby tube (wt.5.1lbs)	H-4210.30
3" dia x 36" long, galvanized shelby tube (wt.6.2lbs)	H-4210.36
3.5" dia x 30" long, galvanized shelby tube (wt.5.5lbs)	H-4210.353
3.5" dia x 36" long, galvanized shelby tube (wt.6.3lbs)	H-4210.356
5" dia x 24" long, galvanized shelby tube (wt.11.8lbs)	H-4210.524
5" dia x 30" long, galvanized shelby tube (wt.17.5lbs)	H-4210.530
5" dia x 36" long, galvanized shelby tube (wt.19.5lbs)	H-4210.536

NOTE: SIZE IS OD.

Shelby Tube Drive Head— H-4202.7A
Drive Head for 3" Shelby tubes for use with H-4202.1 or H-4202.1A Drive Hammers with "E" rod connection, see page 16.

H-4967
(includes pelican case)

H-4965A

H-4966

HM-4502

HSM-2100

Speedy® 2000 Moisture Tester (20g)—H-4967
Speedy® 2000 Moisture Tester (6g)—H-4968
The Series 2000 Speedy moisture tester is a portable system for measuring the moisture content of a wide range of materials including soils, aggregates, dust and powders (and liquids). The system consists of a low pressure vessel fitted with a pressure gauge and an electronic scale and test accessories. Moisture measurements are made by mixing a weighed sample of the material with a calcium carbide reagent in the sealed pressure vessel. The reagent reacts chemically with water in the sample, producing acetylene gas that in turn increases the pressure within the vessel. The pressure increase in the vessel is proportional to the amount of water in the sample, the moisture content can be read directly from the calibrated pressure gauge. The tester is supplied complete with heavy-duty plastic carrying case, electronic balance, beaker, cleaning cloth, cap, washer, scoop, steel pulverizing balls and cleaning brushes. Complies with ASTM D4944 and AASHTO T217. Ship wt. 13 lbs. (5.9kg). **See Warning Below.**

Accuracy: Within 0.5% on most materials
Test Speed: 45 sec. to 3 min., depending on material
Gauge: Calibrated from 0-20% moisture based on wet weight
Balance: Electronic; 0-7 oz (0-200g) range; battery operated

Calibration Kit, Speedy Tester—H-4965A
A self-contained unit designed to enable an operator to check the accuracy of the Speedy Moisture Tester. The unit is comprised of a master dial, integral air pump, control connections and tools for checking gauge accuracy and pressure leaks, with instructions for simple re-calibrations. Includes case. Shipping wt. 20 lbs. (9kg)

Moisture Tester Reagent—H-4966
Calcium carbide reagent for Speedy® Moisture Testers. Carton of 24-1 lb. (0.5kg) containers. Shipped via motor freight only.
See Warning Below. Ship wt. 26 lbs. (11.7kg)

HAZARDOUS WARNING:
Danger of explosion/fire may result if Moisture Testing Reagent is allowed contact with moisture. Calcium carbide forms flammable acetylene gas when wet so it must be kept sealed and dry. Provide adequate ventilation and use away from sparks and flame.

U.S. shipping regulations require ground shipment for Speedy Moisture Testers. H-4966 reagent carton must go truck shipment and incur extra charge for harzadous goods handling

International shipping regulations require separate purchase of reagent, which requires "dangerous goods" papers and packing. For this reason, Speedy Moisture Testers for International orders do not contain reagent, order separately.

Guelph Permeameter Kit— HSM-2100
The Guelph Permeameter is an easy to use instrument for quickly and accurately measuring in-situ hydraulic conductivity. Accurate evaluation of soil hydraulic conductivity, soil sorptivity, and matrix flux potential can be made in all types of soils. The equipment can be transported, assembled, and operated easily by one person. Measurements can be made in 1/2 to 2 hours, depending on soil type, and require only about 2.5 liters of water. Measurements can be made in the range of 15 to 75cm below the soil surface.
The Guelph Permeameter is a complete kit consisting of the permeameter, field tripod, well auger, well preparation and cleanup tools, collapsible water container, and vacuum test hand pump, all packaged in a durable carrying case. Complies with ASTM D5126.
Shipping wt. 33 lbs. (14.9 kg)

Double Ring Infiltrometer— HM-4502
Ideal for field testing, as well as lab use. Two stainless steel rings measure 12 and 24 dia x 20"H (304.8 and 609.6 dia x 508mm). Rings have double thick welded top edge for increased stability when driving into the soil. A mariotte tube provides a constant head of water for flow tests. Graduations on the side of the tube used to determine flow rate. Sealed adjusting tube raises or lowers the head inside the infiltrometer ring. Main flow valve in base platform, bleed valve next to adjusting tube seal. Includes: 1/2" thick (12.7mm) aluminum driving cap with centering pins; two 6" square (152.4mm) neoprene splash guards; and two mariotte tubes with 3,000 ml and 10,000 ml capacities. Complies with ASTM D3385.
Shipping wt. 160 lbs. (72.5kg)

H-4385D

H-4385

H-4388

H-4387

H-4386

H-4386SM

H-4385.5

H-4388.1

Digital Resistivity Meter— H-4385D
The Digital Resistivity Meter provides soil resistivity readings at the push of a button. It provides a direct read-out of resistance without a need to select ranges or adjust dials. The resistance range is from 0.01Ω to 10MΩ (auto-ranging). The meter provides a high-resolution digital display and is housed in a rugged, hard plastic case— safe for use on wet ground. It provides a Bluetooth interface for optional data logging via a Bluetooth-enabled PC. Resistance measurements are unaffected by any stray interference signals, which may be present in the soil during readings, due to the use of narrow band-pass filters centered at 82.2Hz (the unit's operating frequency). Runs on a set of replaceable D-cell alkaline batteries with no need to periodically recharge the unit or to plug it into a power source. Performs 10,000 single readings on a fresh set of batteries. For data logging capabilities, the meter is supplied with an "over-the pipe" soil resistivity survey program, known as "ProCP Soil Resistivity", based on the 4-Pin Wenner Methodology. Complies with ASTM G187.
Shipping wt. 11 lbs (5kg)

Accuracy:
0.01Ω to 1MΩ range: ±1.6% ±1LS Display Digit ±0.01Ω
1MΩ to 10MΩ range*: ±5% ±1LS Display Digit

Resistivity Meter— H-4385
The resistivity meter can be easily used to measure resistivity of soil in-situ using the 2, 3, or 4 electrode method or with a soil box to measure resistivity of soil or water in the range of distilled to sea water. Resistance measurement range is from 0.01Ω to 1.1MΩ and resistance measurements are unaffected by any stray interference signals that may be present in the earth during measurement, due to use of narrow band-pass filters. It has a rugged, lightweight weatherproof case with an IP67 rating for dust and water intrusion. The lid can be removed to facilitate use and movement of the meter to new locations without removing test leads. Runs on a set of C-cell alkaline batteries eliminating recharging and plugged-in power sources. Complies with ASTM G187. Shipping wt. 11 lbs (5kg)

Soil Box, 280ml capacity— H-4386
8.75" x 1.5" x 1.25" (222 x 38 x 32mm), Shipping wt. 1 lb. (.5kg)

Soil Box, Small, 75ml capacity— H-4386SM
4.375" x 1.125" x 1.5" (111 x 29 x 38mm), Shipping wt. 1 lb. (.5kg)

Soil Cylinder— H-4385.5
The Soil Cylinder can be used to satisfy either of the 2-electrode methods— ASTM G187 or AASHTO T-288 Standards. The body of the Soil Cylinder is made of Plexiglas (allowing easy viewing of sample) with PVC components and the distribution plates (conducting end plates) are stainless steel. Rubber O-rings provide sealing for the two end caps. Accommodates large sample volumes [approximately 2,714 cm^3 (2.714 liters) and can accommodate crushed-rock samples, as well as regular soils and liquids. Water can be added in-situ for sample saturation (de-ionized water, simulated rain water etc.) Provides closed, air-tight volume— field-collected samples can be immediately "installed" in the cylinder, as opposed to filling a separate container for transportation. This means that resistance readings taken at a later stage will be representative of the "as-found" condition of the sample.

Resistivity Test Reel with Soil Pins— H-4388
Four pin, test reel set for attaining 1-20 ft. depth measurements. Can be used with any 4-terminal meter. Uses 4-electrode Wenner method. Includes 4 separate, color-coded wires of varying lengths from 5 to 65 ft. Jumper leads (2-foot) are supplied for connection to meter.
Shipping wt. 6 lbs. (3kg)

Soil Box Leads, set of 4— H-4387
The soil box is used with the H-4385 resistivity meter for a quick and accurate measurement of resistivity of a soil or water sample in the field or laboratory. Construction is clear plastic with stainless steel current plates and brass potential pins. The dimensions are such that the measured resistivity with the H-4385, when the box is filled level, can be expressed in ohm-centimeter, making calculations unnecessary. The box can also be used with other meters.

Soil Pins (Electrodes)— H-4388.1
Set of four.